Geophysical Research Abstracts
Vol. 12, EGU2010-15176, 2010
EGU General Assembly 2010

Semi-automatic methods for landslide features and channel network extraction in a complex mountainous terrain: new opportunities but also challenges from high resolution topography

Paolo Tarolli, Giulia Sofia, Francesco Pirotti, and Giancarlo Dalla Fontana

Department of Land and Agroforest Environments; University of Padova, Agripolis, viale dell'Università 16; 35020 Legnaro (PD), Italy; email: paolo.tarolli@unipd.it, phone: +39 (049) 8272695, fax: +39 (049) 8272686

In recent years, remotely sensed technologies such as airborne and terrestrial laser scanner have improved the detail of analysis providing high-resolution and high-quality topographic data over large areas better than other technologies. A new generation of high resolution ($\sim$ 1m) Digital Terrain Models (DTMs) are now available for different landscapes. These data call for the development of the new generation of methodologies for objective extraction of geomorphic features, such as channel heads, channel networks, bank geometry, landslide scars, service roads, etc. The most important benefit of a high resolution DTM is the detailed recognition of surface features. It is possible to recognize in detail divergent-convex landforms, associated with the dominance of hillslope processes, and convergent-concave landforms, associated with fluvial-dominated erosion. In this work, we test the performance of new methodologies for objective extraction of geomorphic features related to landsliding and channelized processes in order to provide a semi-automatic method for channel network and landslide features recognition in a complex mountainous terrain. The methodologies are based on the detection of thresholds derived by statistical analysis of variability of surface curvature. We considered a study area located in the eastern Italian Alps where a high-quality set of LiDAR data is available and where channel heads, related channel network, and landslides have been mapped in the field by DGPS. In the analysis we derived 1 m DTMs from bare ground LiDAR points, and we used different smoothing factors for the curvature calculation in order to set the more suitable curvature maps for the recognition of selected features.

Our analyses suggest that: i) the scale for curvature calculations has to be a function of the scale of the features to be detected, (ii) rougher curvature maps are not optimal as they do not explore a sufficient range at which features occur, while smoother curvature maps overcome this problem and are more appropriate for the extraction of surveyed channels and landslides, iii) the adopted methodologies based on the statistical analysis of variability should be considered as an useful tool for objective extraction of geomorphic features. These conclusions highlight the opportunities, but also the challenges, in fully automated methodologies of geomorphic feature extraction.